to zero at 3° A.; at this temperature the resistance of mercury is less than one ten-millionth of its value at 0°, whilst at 1·5° A. it is still smaller; (4) investigations of magnetic susceptibility and thermoelectric force. Attention may also be directed to two articles on the fixation of atmospheric nitrogen in the same journal of November 30 and December 15, 1911; these are accompanied by a series of interesting and unfamiliar illustrations.

THE first number of *The Chemical World* is a very readable production. The new journal is a monthly periodical published by Messrs. J. and A. Churchill; its aim is "to present to those interested in the many branches of chemistry an account of progress in both theory and practice." Written from this viewpoint, a number of short articles deal with various topics of chemical interest, and form the chief feature of the magazine. Among these are "The Detection of Mydriatic Alkaloids," by Mr. F. H. Carr, discussing a problem which arose recently in a notable murder trial; "The Chemical Characterisation of Soils," a useful contribution by Dr. E. J. Russell; "The Recent Progress of Organic Chemistry," in which Dr. A. Clayton describes Knorr's isolation of the ketone and enol forms from ethyl aceto-acetate; and a summary of "Metallurgical Progress in 1911," by Mr. G. T. Holloway. An illustrated article on the chemical department of the Royal College of Science, with a portrait of Sir Edward Thorpe, is the first of a series of similar accounts which will deal with the chemical establishments of modern universities and technical colleges. Other serial contributions commenced are one by Mr. E. Hatschek on "The Physics and Chemistry of Colloids," and one on "Chemical Research" by the editor. Sections are also devoted to physical chemistry, chemical engineering, and chemical industries, whilst patents and commercial matters are not forgotten. Thus the new venture appeals to many interests, and, judging by the first issue, it deserves a cordial welcome.

IN a paper on the direct experimental determination of the stresses in the steel and in the concrete of reinforced-concrete columns, read before the Institution of Civil Engineers on January 9 by Mr. W. C. Popplewell, is described a method of measuring the simultaneous shortening of the steel bars and of the concrete. Martens extensometers were used; for the steel these were applied to the ends of pairs of pins projecting from the reinforcing bars through holes in the concrete; for the concrete the extensometers were applied to the surface as near as possible to the steel. The elastic moduli for the steel and the concrete were thus found to be 30,200,000 and 1,535,000 lb. per square inch respectively. A further set of experiments carried out to determine the intensity of the frictional grip of the concrete on the steel resulted in values ranging from 300 to 600 lb. per square inch of bar surface, to cause slipping. When all the effects of eccentric loading have been eliminated from the results of the tests on columns, there is no evidence to indicate that slipping took place. In columns of this kind, made up with plain smooth bars, the two materials behave like one, so far as their strain effects are concerned.

AN article on propeller erosion in *Engineering* for January 12 gives an account of a research conducted by Dr. O. Silberrad, of Buckhurst Hill, Essex, in conjunction with the Manganese Bronze and Brass Company, Ltd. Propellers driven by comparatively slow-running reciprocating engines are free from erosion when constructed of manganese bronze. When, however, the same alloy was used for turbine-driven propellers erosion reappeared, and often of a very serious character. In the case of the *Mauretania* and *Lusitania*, had no remedy been found the propellers would have required replacing every few months at a cost of some thousands of pounds. Each propeller weighed about 20 tons, and the cost ranges from 130*l.* to 180*l.* per ton. The erosion seems to have been due to the eutectic being washed away, the mixed crystals constituting the main mass of the alloy being practically unaffected. The research has been successful in the discovery of an alloy which is now in actual service on the *Mauretania*, and has proved itself practically inerodible. The new alloy is patented conjointly by Mr. P. R. Parsons, of the Manganese Bronze and Brass Company, and Dr. Silberrad, and is called Parsons' New Turbadium. It has a tensile strength of 38 to 40 tons per square inch, an elastic limit of 18 to 19 tons per square inch, and an elongation of 15 per cent. on 2 inches. In the erosion tests it showed an endurance about five times that of ordinary high-tension bronze, and this result has been confirmed in actual service. We understand that the British Admiralty has approved its use for the propellers of war vessels fitted with turbine engines.

THE thirty-ninth issue of "Willing's Press Guide," that for 1912, has, as usual, been carefully revised, and well maintains its character as a handy and easily consulted index to the Press of the United Kingdom and to the principal colonial and foreign periodicals. A variety of general information adds to the value of the volume.

A COPY of a convenient monthly weather chart for daily observation has been received from Messrs. George Philip and Son, Ltd. Provision is made for a record of readings of the wet and dry-bulb thermometers, maximum and minimum thermometers, rain-gauge, and barometer. Space is also allotted to wind and weather observations. The price of each sheet is one penny.

A NEW and enlarged edition of "Soap-bubbles: their Colours and the Forces which Mould them," by Prof. C. V. Boys, F.R.S., has been published by the Society for Promoting Christian Knowledge. The several new and original sections which the present issue contains provide, like the lectures Prof. Boys has been giving lately to the Royal Society of Arts juvenile audiences, still further evidence of the author's genius for experimenting and his talent for clear and interesting exposition. The price of the new edition is 3*s*.

SIR EDWARD THORPE's well-known "Dictionary of Applied Chemistry" is being revised and enlarged, and Messrs. Longmans and Co. announce that the new edition will be issued in five volumes. The first volume will be ready in a few days, and vol. ii. early in the summer. It is hoped that the work will be completed within two years. Messrs. Longmans announce also that the work on "Surgery," by Sir W. Watson Cheyne and Mr. F. F. Burghard, has been entirely revised and rewritten with the assistance of Mr. T. P. Legg and Mr. Arthur Edmunds. The first volume will be issued before the end of the present month, and vol. ii. in April next.

OUR ASTRONOMICAL COLUMN.

POSSIBLE CHANGES IN SATURN'S RINGS.—At the meeting of the Royal Astronomical Society, held on Friday last, it was announced that a telegram had been received, by Sir David Gill, from Prof. Todd, in which he said:—"Near the extremities of the major axes of the bright outer ring of Saturn, with the aid of a powerful telescope, I have

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observed a certain sparkling flocculence which I interpreted to be a dissipation of the ring."

Commenting on this message, the Rev. T. E. R. Phillips stated that he had observed Saturn the previous night, but had failed to note any extraordinary feature such as was described in Prof. Todd's message; it was, however, possible that the affected section of the ring was not then in view. He also added that, according to the accepted view of the constitution of the rings, disturbances of some kind were likely to occur from time to time, and that these might be revealed by irregularities in the shape of the shadow of the ball on the rings. At the previous apparition he had seen such irregularities, but recently he had thought the shadow perfectly uniform. Other observers, who had been able to see the Encke's division easily, had also noted nothing irregular or unusual.

A *Daily Mail* inquiry at Greenwich elicited the suggestion that the phenomenon may have been produced by the collision of two of the particles forming the ring, the heat generated by the impact possibly raising the particles to incandescence. Owing to the comparatively large separation of the particles and their uniform motion, such collisions would not be of frequent occurrence.

MARS.—Numerous observations made at the Sétif Observatory are recorded in No. 4545 of the *Astronomische Nachrichten*. Among other things, the disappearance of the south polar spot since December 13, 1911, is noted, and it is remarked that its position was occupied by a large, well-marked area having the same hue as the southern "islands." Special attention has been paid recently to the study of Libya, which M. Jarry-Desloges considers important in the study of abnormal clear places on Mars. He gives details of observations showing changes in the brightness and tint of Libya during the period December 14–23, 1911. A telegram received on December 28, 1911, states that the Thyle region had been abnormal since December 18, being whitish with brilliant spots. The Styx was observed double, and M. Tyrrhenum and Syrtis Minor were always vague. Telegraphing on December 30, the same observer stated that considerable changes had taken place in the north polar cap during the preceding twenty-four hours. An important white band was seen between Propontis and Palus Mæotis, and M. Tyrrhenum was extended over Eridania. On January 4 M. Jarry-Desloges announced the reappearance of the south polar cap.

A NEW VARIABLE OR NOVA, 87, 1911, PERSEI.—Mr. C. R. D'Esterre, in a note appearing in No. 4545 of the *Astronomische Nachrichten*, describes his observations of an object in Perseus which would appear to be a new variable star or a nova. On a photograph taken on November 13, 1911, when the object was at its maximum brightness, about mag. 11–12, the image of the newly discovered variable overlapped the images of two neighbouring stars, whereas it is not shown at all on photographs showing objects much fainter than the eleventh magnitude taken with the same instruments during August, 1911. The position of the object in question is 2h. 0m. 13·1s., +56° 29·8′ for 1855·0, and 2h. 3m. 16·3s., +56° 42·8′ for 1900·0.

THE LIGHT OF COMETS 1911*b* AND 1911*c*.—In a note appearing in No. 4545 of the *Astronomische Nachrichten* M. Orlow discusses the varying brightness of Kiess's (1911*b*) and Brooks's (1911*c*) comets. Admitting that the brightness is proportional to Δ^{-2}, he seeks for the different comets the exponent of the quantity r. For Brooks's comet, from twenty-three observations made during August 27 to October 13, he finds that $1/\Delta^2 r^{3\cdot 2}$ gives the nearest approximation to the observed curve, H_0, the mean brightness, being 5·1.

From twelve observations published by Dr. Holetschek he finds that $H_0 = 7\cdot 2$ and $r^{-3\cdot 4}$ are the values which best fit the brightness of Kiess's comet. For two other comets, 1910*a* and 1908*c*, he derives the values $H_0 = 5\cdot 4$, $r^{-4\cdot 6}$, and $H_0 = 4\cdot 3$, $r^{3\cdot 5}$, respectively.

THE SOLAR CONSTANT.—In No. 5, vol. xxxiv., of *The Astrophysical Journal* Prof. Very has an article on the need of adjustment of the data of terrestrial meteorology and of solar radiation, and on the best value of the solar constant. In it he criticises the recent work of Abbot and Fowle in the determination of the solar constant, and argues that while their methods purport to follow Langley's methods, they have abandoned the essential principle of the latter, and more nearly approximate to Pouillet's. Prof. Very argues that too low a value has been assigned to the effective depletion of the incident solar rays, and consequently too low a value has been obtained for the solar constant. Whereas the value of approximately 2 calories is given in the second volume of the Annals of the Astrophysical Observatory of the Smithsonian Institution, Prof. Very finds evidence on every hand that the value should be greater than 3 but less than 4 calories.

THE SURVEY OF INDIA.[1]

THE report of the operations of the Survey of India during the year 1909–10[1] has just been issued by Colonel S. G. Burrard, R.E., F.R.S., the Officiating Surveyor-General. During the year the new scheme of reorganisation which had been approved was brought into operation, and in it provision is made for three topographical circles, the northern, southern, and eastern, each under a superintendent. Four topographical survey parties are allotted to each, and there are six trigonometrical parties under the direction of the Superintendent of Trigonometrical Surveys. Details are given of the topographical work executed in each of the three circles, and maps show the distribution of the areas surveyed and the portions which have been surveyed since October, 1905. The forest surveys were carried out in almost every case by the particular topographical parties in whose spheres of work the forests lay, and were mainly on the scale of 2 inches to 1 mile.

The principal triangulation was continued in the North Baluchistan series, the Kashmir series, and in the Upper Irrawaddy series, a total of thirty-five stations being observed from, and thirty-nine triangles being completed, the average angular errors being 0·303″, 0·591″, and 0·381″ respectively in the three areas of work. A series of comparisons was carried out to test the accuracy of mercurial barometers, aneroid barometers, and hypsometers as height-measuring instruments. The results showed that the aneroid barometers differed greatly from one another and from the mercurial barometers. The latter gave heights in defect, and the hypsometers gave heights considerably in excess of those obtained by triangulation; the excess at 16,000 feet being as much as 600 feet. Astronomical latitudes were observed in Oudh, and pendulum operations were extended to the east and north-east of the area investigated in the season 1908–9 in Central India, twelve stations having been visited this year in the tract situated between lats. 21° and 26° N., and longs. 79° and 83° E. The magnetic survey and the tidal operations were continued.

At Dehra Dun the base-line observatory was commenced in 1909, and its construction is now in hand. A complete apparatus of wires has been purchased to replace the old compensation bars, and approximate sites for base lines in Burma and Baluchistan have been selected. The simultaneous reduction of the levelling was completed during the summer of 1910; all closing errors of circuits were eliminated, and the level net was connected to sea-level at nine different points; orthometric corrections were applied, and adjusted values of all bench-marks fixed between 1858 and 1909 were obtained. The results are published as vol. xix. of the "Account of the Operation of the Great Trigonometrical Survey of India," and the publication of this volume marks the close of the first half-century of levelling work in India, thus providing a scientific and consistent basis for the levelling operations of the future.

H. G. L.

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[1] The General Report on the Operations of the Survey of India during the Survey Year 1909–10. Prepared under the direction of Colonel S. G. Burrard, R.E., F.R.S., Officiating Surveyor-General of India. (Calcutta, 1911.) Price 2 rupees or 3*s*.

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